1. PROJECT IDENTIFIERS

Reporting Period:

Program Sponsors:

DOE High Energy Physics Division/NSF Physics Division DOE/NSF Program Manager:

T. Toohig, (301) 903-4115, timothy.toohig@science.doe.gov DOE/NSF Associate Program Manager:

M. Goldberg, (703) 306-1894, mgoldber@nsf.gov Chicago Operations Office/Fermi Area Office DOE/NSF Project Manager:

J. Yeck, (630) 840-2530, jim.yeck@ch.doe.gov

2. PROJECT DESCRIPTION

The Department of Energy (DOE) and the National Science Foundation (NSF) have signed agreements committing to collaboration in the construction of the Large Hadron Collider (LHC) at CERN (European Laboratory for Particle Physics) and two of its associated detectors. The U.S. fabrication effort will be carried out at, or under the supervision of, U.S. universities and national laboratories under the terms and conditions described in the International Collaboration Agreement (Agreement) and its Accelerator and Experiments Protocols. The U.S. LHC Construction Project is defined by the goods and services to be provided to CERN under the terms of the Agreement between DOE, NSF, and CERN. These goods and services include DOE contributions to the LHC accelerator, and DOE and NSF contributions to the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) experiments.

The DOE contribution to the LHC accelerator consists of items provided by DOE National Laboratories and CERN direct purchases from U.S. industrial firms. The scope of these contributions is addressed in the Accelerator Protocol and described in detail in an Implementing Arrangement between the collaborating DOE National Laboratories and CERN. The DOE and NSF contributions to the ATLAS and CMS detectors consist of items supplied by the collaborating U.S. universities and DOE National Laboratories. The scope of these contributions is addressed in the Experiments Protocol and described in detail in Memoranda of Understanding for collaboration on construction of each experiment.

The U.S. LHC Construction Project includes the U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator projects. This report summarizes the overall status of the U.S. LHC Construction Project effort and includes more detailed status information on each sub-project. Additional information can be accessed at the following web sites:

U.S. LHC Project - http://www.hep.net/doe-hep/lhc.html

LHC Project - http://www.td.fnal.gov/
U.S. LHC Accelerator - http://www-td.fnal.gov/

ATLAS - http://atlasinfo.cern.ch/Atlas/Welcome.html U.S. ATLAS - http://www.usatlas.bnl.gov/

3. PROJECT MANAGER'S NARRATIVE HIGHLIGHTS

The current list of DOE/NSF project reviews and status meetings is provided below:

U.S. LHC Construction Project	Event	Date
U.S. CMS Detector	DOE/NSF Review	May 8-10, 2001
U.S. LHC Accelerator	DOE/NSF Review	May 13-14, 2001
U.S. ATLAS Detector	Quarterly Status Meeting	June 20, 2001
U.S. LHC Accelerator	Quarterly Status Meeting	August 29, 2001
U.S. CMS Detector	Quarterly Status Meeting	August 30, 2001
U.S. ATLAS Detector	DOE/NSF Review	September 20, 2001
U.S. CMS Detector	DOE/NSF Review	November 15, 2001
U.S. LHC Accelerator	DOE Review	December 4-5, 2001

The results of these activities are documented in formal reports and meeting notes. The U.S. CMS and ATLAS projects submit monthly reports and the U.S. LHC Accelerator project submits a quarterly report. Current performance data is summarized in the following tables:

Table 3.1, Schedule Performance Indices

	Planned Complete (BCWS/BAC)	Actual Complete (BCWP/BAC)	Schedule Performance (BCWP/BCWS)
U.S. ATLAS	49.3%	48.6%	99%
U.S. CMS	65%	56%	86%
U.S. LHC Accelerator	68%	65%	95%

Table 3.2, Contingency Status (in thousands of dollars)

			-	Budgeted Cost	Remaining	
	Total Project	Budget at		of Work	Work to be	
	Cost	Completion		Performed	Performed	Contingency/
	(TPC)	(BAC)	Contingency	(BCWP)	(BAC-BCWP)	(BAC-BCWP)
US ATLAS	163,750	133,812	29,938	65,054	68,758	44%
US CMS	167,250	138,826	28,424	77,785	61,041	47%
US Accelerator	110,000	103,196	6,804	66,700	36,496	19%

Table 3.3, Cost & Schedule Performance (in thousands of dollars) Indices

Tuest tie, cost et s'elleure i elleure (ill une usumus el uellurs) illustes										
Cumulative Costs to Date										
	Budgeted Cost						s at Comple	tion		
	Work Work		Work Actual Variance		Variance		Variance		Revised	
	Scheduled	Performed	Cost	Schedule	Cost	Budgeted	Estimate	Variance		
U.S. ATLAS	66,015	65,054	64,777	-961	277	163,750	163,750	0		
U.S. CMS	90,328	77,785	69,873	-12543	7912	167,250	167,250	0		
U.S. LHC Accelerator	69,851	66,700	65,934	-3151	766	110,000	110,000	0		
CERN Invoices	23327	23327	23327	0	0	90,000	90,000	0		
U.S. LHC Total	249,521	232,866	223,911	-16655	8955	531,000	531,000	0		

4. PROJECT MANAGER'S ASSESSMENT

The U.S. projects continue to meet their goals and are reliable and influential partners in the construction of the ATLAS and CMS detectors and the LHC machine.

Cost – Cost performance is good as material contracts are typically below estimates and labor costs continue to track close to plans. Each project maintains an adequate level of contingency, although the present EAC for the U.S. LHC Accelerator project indicates a contingency level that is of minor concern. Favorable changes in cost variance for the Accelerator project have been achieved through recent rebaselining of the BNL and FNAL programs. Rebaselining is also in process for the LBNL program which is presently undergoing review by the US LHC Accelerator Project Office, with particular focus on the cryogenic feedbox system .

The U.S. LHC Accelerator project office has been actively and aggressively addressing the contingency concern through careful revision of the estimate to complete for all three Lab's activities. Change control and review has been exercised by the project office and Inter-Lab Steering Committee to rebaseline superconducting cable tests and dipole magnet work at BNL; absorber, luminosity instrumentation and cryogenic feedbox work at LBNL; IR quad work at FNAL and accelerator physics work across Labs. Presently the LBNL cryo feedbox rebaseline proposal has been sent back for further review. Present Obligation Profile projections for FY02, as compared to expected FY02 funding, may necessitate adjustment of CERN Direct Payment funding profile to mitigate a potential shortfall.

The U.S. CMS contingency situation has remained steady, and the project is carefully monitoring apparent divergence of costs in the Endcap Muon (EMU) subsystem. The project is reviewing cost growth in this system, and there will be a Quarterly Status Meeting at UCLA this week, where EMU production is to get underway, to further address this issue.

The U.S. ATLAS project continues to carefully manage contingency, and is undertaking a sensitivity analysis for each subsystem to re-confirm realistic contingency estimates. The project has been directed to review Technical Coordination efforts to date, to validate any further use of contingency in that important area.

Schedule - Schedule performance is measured through milestone completion and by earned value. These measurements indicate that schedule progress is slightly behind plans averaging about ninety-three percent of the baseline plan, indicating no major slipages in schedule. The total U.S. LHC Project is fifty-seven percent complete, based on earned value. CERN expects to complete construction of the LHC in 2005 and initiate collider commissioning in 2006. Current CERN schedule calls for first collisions in April 2006 and first physics in August 2006. The U.S. schedules are consistent with this goal.

CERN has been working with experiments to agree on a revised schedule, and this has been adopted by US CMS for present planning purposes. Once CMS officially adopts this schedule, US CMS will initiate a change request that will reflect this version and adjust US CMS milestones accordingly. The US CMS Project Office is tracking this schedule and ascertaining

potential cost impacts on the project, to better plan installation and commissioning as well as project completion. U.S. ATLAS is updating the baseline schedule and float for each subsystem to reflect new CERN required delivery dates, based on the new CERN schedule and maintaining the project completion date of September 2005.

Technical – Good technical progress continues across the project, and we remain confident that the U.S. deliverables to CERN can be realized with the planned funding. The U.S. LHC Construction Project deliverables are accepted by CERN and approved by the DOE/NSF Joint Oversight Group. We expect to provide additional items to CERN, within the approved funding, should cost performance be favorable.

Important milestones are being met. The Accelerator project has begun Interaction Region quad production assembly a made the decision that the U.S. Project will not include RF region quadrupoles. U.S. CMS Hadron Calorimeter barrel wedges for half the barrel have been installed with scintillator tiles, and are being moved to the CMS surface building for assembly. U.S. ATLAS has delivered the Liquid Argon Calorimeter Barrel Cryostat to CERN. Additional technical Project highlights are given in section 5, and shown in the photos

ISSUES

LHC Schedules – CERN has agreed on a new schedule for the machine, with the ring closed/cold by 12/05, first collisions/pilot run starting 4/06, followed by a 3 month shutdown and first physics starting 8/06. Both experiments are revising and reworking initial detector configuration and installation plans with the goal of initial detectors ready for first collisions and complete detectors (with staging options) ready for the first physics run. ATLAS is completing a detailed, multi-phased installation scenario taking into account the delay in the availability of the underground cavern. CMS is planning and identifying resource issues associated with moving more assembly, testing and installation activities from the underground to the surface facility. DOE and NSF staff continue to closely monitor this planning activity.

ATLAS and CMS Resources—Estimates of the resources required to complete the experiments exceed the funding currently identified, as discussed at the April '01 Resource Review Board (RRB) meeting. Funding shortfalls are driven by several factors: various institutes not meeting their original commitments, improved estimates of the funding required to complete the detectors, cost overruns on core items, exchange rate problems, and (mainly for CMS) civil construction delays. At the RRB meeting, both collaborations and CERN indicated that they will work with the international Funding Agencies to seek additional resources, or develop appropriate work-around plans for completing the detectors. CMS and ATLAS are currently ~50% complete. Experiment and civil construction cost status will be presented to the CERN Council and further addressed in December 2001.

Radiation Hard Electronics - Significant challenges remain in the development of radiation hard electronics for the ATLAS and CMS experiments including production yields and limited vendor options. Export license and dual-use technology issues are additional complications.

5. NARRATIVE SUMMARY

5.1 U.S. ATLAS CONSTRUCTION PROJECT

ATLAS International – ATLAS project and technical management have nearly completed a major effort to re-baseline the various schedules (sub-detector, infrastructure and common projects) to meet new installation dates. Start of installation could be as early as February 2003, when UX15 cavern should be finished. ATLAS Week was held at BNL in June 2001, with a major focus on Technical Coordination and Integration. Other ATLAS highlights are summarized below:

- Point 1 surface buildings (control, gas, cooling and ventilation) have been handed over to CERN; primary cooling towers and detector 66 kV electrical substation are commissioned.
- Technical cavern USA15 and its access shaft are almost finished; main cavern wall and vault concreting is proceeding and further main cavern excavation will continue in August 2001.
- Two new types of internal ATLAS reviews are in place (Production Advancement and System Overviews), and have been conducted for some detector subsystems.
- Tile Calorimeter module construction is well advanced, with over 50% of the modules ready, and new ones arriving monthly at CERN.

U.S. ATLAS - The overall project, as of June 30, 2001, was actually 51.6 percent complete versus the 52.4 percent planned. A DOE/NSF Quarterly Status Meeting was held at Brookhaven National Laboratory on June 20, 2001. The U.S. Collaboration continues to make good technical progress, with no major technical issues identified. Costs have been controlled such that contingency as a fraction of cost to go has not been reduced. Most U.S. ATLAS subsystems are currently in production, and strong progress has been reported in the area of radiation-hard electronics. Schedule status indicates that U.S. ATLAS should meet ATLAS need dates for U.S. deliverables. Listed below are project highlights:

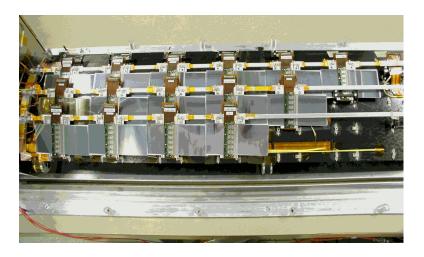
- Silicon Strip System Production Readiness Review for the Integrated Circuit (IC) electronics was passed; first production ICs should arrive in August.
- Transition Radiation Tracker Mechanics: Six modules are completed at Indiana, seven modules completed at Duke, and eight modules in production.
- Liquid Argon Calorimeter Barrel Cryostat arrived at CERN; signal feedthrough production is on schedule and HV feedthrough parts are nearly ready for shipment to CERN.
- Tile Calorimeter module construction is going well in the U.S, and 26 modules (out of 36 assembled mechanically) have been instrumented, tested, and shipped to CERN.
- Muon Spectrometer Monitored Drift Tube chamber sites have started retooling for the next chamber series; delivery of parts for tube and base chamber construction, and tube production, has been ahead of need and off the critical path.
- Trigger/DAQ User requirements and design documents are being reviewed. and the level 1-level 2 interface document is being updated; computer architecture evaluation and feedback of useful timing information to the offline developers is progressing.



Left- The ATLAS liquid argon calorimeter barrel cryostat after arrival at CERN from Japan. It was fabricated by Kawasaki Heavy Industries Ltd., managed and under under contract from Brookhaven National Laboratory (BNL) as part of the U.S. ATLAS Project.

This cryostat, an important U.S. deliverable, consists of two concentric cylinders made of aluminium: the outer vacuum vessel, 5.5 m in diamater and 7 m long, and the inner cold vessel which will contain the electromagnetic barrel calorimeter immersed in liquid argon. The cryostat is now located in building 180 where it will be equipped with 64 feed-throughs which serve for the passage of 122,880 electrical lines which will carry the signals of the calorimeter.

Right-The ATLAS Inner Detector Semi-Conductor Tracker (SCT) group passed an important milestone when the barrel system test performance was reviewed. The picture shows 15 SCT barrel modules at CERN, where tests supported by the University of California-Santa Cruz indicated that the design of the barrel module meets the electrical performance requirements of ATLAS.



The four barrel production clusters in the U.S, Japan, Scandinavia, and UK have all built several modules and are now preparing their infrastructure and tooling for mass-production of more than 2000 modules

5.2 U.S. CMS CONSTRUCTION PROJECT

CMS International – CMS project managers and coordinators are finalizing schedule milestones for the revised baseline that addresses constraints concerning availability of the underground experiment cavern. Ready for installation milestones are being introduced to decouple pre-assembly of major items from their use in the master assembly sequence, assuming delivery of experiment and service caverns in mid-2004. Shrinkage of the underground window will likely lead to cabling and commissioning defining CMS critical path, rather than mechanical assembly. Other CMS highlights are summarized below:

- Largest single CMS element, inner vacuum tank which will house CMS magnet superconducting coil and support inner detectors, arrived at Point 5.
- Construction of surface buildings (cooling, ventilation and gas) is progressing well, with hand-off to CERN in July, 2001.
- Digging of pillar between USC5 and UXC5 is finished and concreting has started.
- Hadron Calorimeter Readout Box was approved for manufacture after resolution of technical integration issues; PNPI and IHEP sites started pre-production of Muon CSC chambers.

U.S. CMS – The overall project, as of June 30, 2001, was actually 56 percent complete versus the 65 percent planned. A DOE/NSF full review was conducted May 8-10, 2001 at Fermilab. U.S. CMS is performing well with respect to technical and cost goals, while schedule remains a closely monitored issue. Progress is being made with calorimeter and muon system electronics on the critical path affecting further production of some items. A DOE/NSF Quarterly status meeting is scheduled to be held on August 30, 2001 at UCLA, a site with responsibilities for electronics and muon systems. Listed below are project highlights:

- Production of the Muon Cathode Strip Chamber (CSC) panels is going ahead at the rate and at the cost estimated in the WBS cost estimate (over 50% complete), and production of CSC chambers at Fermilab is proceeding well.
- The first Hadron Calorimeter (HCAL) half barrel at CERN is being reassembled in the CMS Surface Building-SX5; insertion of the optics into the first barrel wedges was completed at CERN as planned, and U.S. production of the HCAL Barrel scintillator tiles is on schedule;
- A muon trigger electronics voltage regulator issue has been addressed by finding a suitable commercial device, which should remove the low voltage board from the critical path; the DAQ effort continues essentially on budget and on schedule.
- Forward Pixel effort is now moving from R&D to prototyping, and has defined construction milestones through to completion.
- Assembly and installation of major sections of the CMS magnet end-cap steel yoke (U.S. Common Project) assemblies has been completed.
- Set-up and debugging of the Silicon Tracker module gantry system at Fermilab for automated production has made substantial progress, and planning for additional assembly facilities at UC-Santa Barbara is underway.



Above- U.S. CMS team from Fermilab and University of Rochester at CERN, after completing installation of the Hadron calorimeter (HCAL) scintillation tiles into the barrel wedges at Building 186;

Above (Top)- HCAL barrel wedges are presently being moved from Building 186 to the CMS Surface Building SX-5 for assembly.



Above- Completed assembly of a CMS Magnet end-cap steel yoke section (YE-2) at CERN, part of the U.S. CMS Common Projects.

5.3 U.S LHC ACCELERATOR CONSTRUCTION PROJECT

LHC – Commissioning schedule important dates remain as follows: first octant test- 4/04; last dipole produced-4/05; rings cold-12/05; first beam-2/06; pilot run-4/06; shutdown-5-7/06; physics run-8/06. The CERN Director-General has chaired a series of joint LHC Machine-Detector meetings to provide a regular forum for mutual planning between the accelerator and experiments.

- The first LHC dipole test results were very satisfactory, with first quench near the nominal operating level (8.34 Tesla), and no further quench when the magnet was powered to the ultimate field limit (9 Tesla).
- Cryogenic dipole assembly call for tender is out, with adjudication expected by September; contracts for all main components of dipoles are now placed and series production has started, but slow progress by superconducting cable vendors continues to pace the dipole program.
- CERN and the U.S. are working together as necessary to achieve tighter configuration management, as final designs are translated into production of components
- One of the new transfer tunnels to provide protons from SPS to LHC (T12) has broken through into the LHC tunnel near Point 2.

U.S. LHC Accelerator - The overall project, as of June 30, 2001, was actually 65 percent complete versus the 68 percent planned. A DOE/NSF review was held at Fermilab on May 14-15, 2001 with the next DOE/NSF Quarterly Status meeting scheduled for August 29, 2001 at Fermilab. The level of contingency available in the project is a minor concern, due to cost growth identified during the last estimate to complete. Project management continues to fully evaluate project scope and contingency across the entire project to increase the available contingency budget. There are no major issues with technical progress and the schedule of deliverables remains well in advance of CERN requirements. Project highlights are listed below:

- [Fermilab] Prototype quadrupole cold mass and cryostat (Q2P1) was completed, installed on the test stand, tested at 2K and met all requirements on the first cycle. A second thermal cycle is planned for next quarter. Quadrupole cold mass production has begun, and the first unit collared coil was completed. The CERN/US/KEK meeting was held at KEK, including a visit to Toshiba to see the prototype magnet and to perform a trial insertion of beam tube.
- [BNL] Magnet production continues: all D1 cold masses have been assembled and are undergoing surveying, straightening and preparation for piping installation. The first D2 cold mass and second D2 collared coils are essentially complete. CERN is changing the configuration at LHC Insertion Region 4 which will reduce the number of D3 and D4 magnets and simplify the interconnects, although this will require some redesign of D4 connections.
- [LBNL] Design of DFBX cryogenic feedboxes is over 70% complete. Letters of Inquiry have been sent to vendors interested in fabricating the vacuum boxes, helium vessels, thermal shields and vapor cooled leads. Detailed design of the TAN and TAS absorbers is nearly

complete and the design effort has ramped to a low level with effort concentrating on procurement of parts and plans for assembly. The large steel and copper pieces have been received and the copper beam tube channels have been machined.

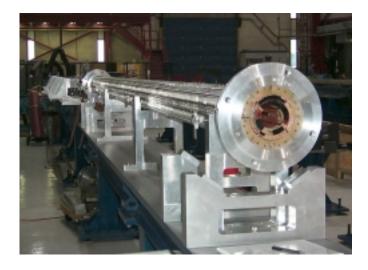




Above- Completed cold mass assembly for the first production D1 dipole at BNL. The lead end is shown on the left and the non-lead end is shown on the right.



Above- Vacuum vessels for D1 magnets at BNL.



Left- Completed collared coil for the first production quadrupole, MQXB01 at Fermilab.



Above (Left) Slots being machined in TAN copper absorber for beam tubes and (Right) Top iron shielding for TAN absorber, both at

CERN Direct Purchases - DOE reimburses CERN for their payments to qualified U.S. vendors [Reference U.S.-CERN Agreement and Accelerator Protocol]. The status is shown in Table 5.1.

Table 5.1, Status of DOE Payments (in \$000)

Contract Item	Company (U.S. Supplier)	Amount	Contract	w/ options
Niobium-Titanium Alloy Bars	Wah Chang	18,668	38,667	48,431
Niobium Sheets	Wah Chang	2,682	5,633	6,951
Polyamide Insulation Film	Kaneka High Tech Materials	659	5,425	6,510
Superconducting Cable	IGC Advanced Superconductors	1,151	16,447	20,985
LHC BPMS Button Feedthroughs	Ceramaseal	0	898	1,003
Cryogenic Temperature Sensor	Lakeshore	167		
Cryogenic Helium Mass Flowmeters	(tbd-contract in process)	0	1,200	1,200
(tbd-contract in process)	(tbd-contract in process)	0	(tbd)	3,134
Totals		23,327	68,270	88,214

6. FINANCIAL/COST STATUS AND PLANS

TOTAL PROJECT FUNDING PLAN (then year millions of dollars)*

TOTHERMODEC	101/121 ROSECT 1 CROMNOTEMIN (then year minions of donars)										
Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	Total
Machine Funding Profiles (DOE)											
US LHC	2.00	6.67	14.00	15.40	24.92	9.36	14.20	11.20	8.33	3.92	110
CERN Direct	0.00	0.00	0.00	8.09	8.29	17.88	8.00.	10.90	21.00	15.84	90
Machine Total	2.00	6.67	14.00	23.49	33.21	27.24	22.2	22.1	29.33	19.76	200
Detector Funding Pr	ofiles (l	DOE an	d NSF)								
US ATLAS	1.70	3.71	10.05	25.63	28.43	26.77	21.85	25.89	14.69	5.03	163.75
DOE	1.70	3.71	10.05	9.00	16.49	14.48	9.2	18.6	14.69	5.03	102.95
NSF	0.00	0.00	0.00	16.63	11.94	12.29	12.65	7.29	0.00	0.00	60.80
US CMS	2.30	4.62	10.95	38.03	24.26	21.23	21.81	21.73	15.98	6.34	167.25
DOE	2.30	4.62	10.95	32.51	20.30	17.15	17.6	19.3	15.98	6.34	147.05
NSF	0.00	0.00	0.00	5.52	3.96	4.08	4.21	2.43	0.00	0.00	20.20
Detectors Total	4.00	8.33	21.00	63.66	52.69	48.00	43.66	47.62	30.67	11.37	331.00

TOTAL DOE & NSF FUNDS, COSTS, & COMMITMENTS (cumulative \$000)[†]

	A = Funds	B = Estimate	C = Open	D= B+C	A-D = Funds
U.S. LHC Construction Project	Allocated	Actual Costs	Commitments	Total	Available
U.S. ATLAS	96,290	64,777	6,975	71,752	24,538
U.S. CMS	101,390	69,873	19,258	89,131	12,259
U.S. LHC Accelerator	72,350	63,006	2,928	65,934	6,416
CERN Direct Purchases	34,260	23,327	0	23,327	10,933
Total	304,290	220,983	29,161	250,144	54,146

^{*} This report includes a revision to the funding profile for the U.S. LHC Construction Project that is addressed in the FY 2001 budget planning for DOE. The revision to the original profile was made in order to better match the needs of the construction projects. This report also includes a change in the distribution of funds between the U.S. LHC Accelerator project and the CERN direct project to address delays in CERN invoices.

[†] Based on financial reports from the U.S. LHC construction projects. NSF funding is provided after the beginning of the fiscal year and therefore it is necessary to carry-over funding into the subsequent fiscal years.

7. DOE/NSF COST BASELINES AT LEVEL 2 (in \$000)

U.S. ATLAS Cost Baseline

WBS	<u>Description</u>	Previous	Change	Current
1.1	Silicon System	17,755	0	17,755
1.2	Transition Radiation Tracker	9,194	0	9,194
1.3	Liquid Argon Calorimeter	42,171	0	42,171
1.4	Tile Calorimeter	9,148	0	9,148
1.5	Muon Spectrometer	26,391	0	26,391
1.6	Trigger/Data Acquisition System	10,957	0	10,957
1.7	Common Projects	9,179	0	9,179
1.8	Education	287	0	287
1.9	Project Management	8,280	0	8,280
1.10	Technical Coordination	450	0	450
	Contingency	29,938	0	29,938
	U.S. ATLAS Total Project Cost Baseline	163,750	0	163,750

U.S. CMS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Endcap Muon	35,995	68	36,063
1.2	Hadron Calorimeter	38,336	106	38,442
1.3	Trigger and Data Acquisition	13,719	22	13,741
1.4	Electromagnetic Calorimeter	9,564	366	9,930
1.5	Forward Pixels	6,756	0	6,756
1.6	Common Projects	23,000	0	23,000
1.7	Project Office	7,530	39	7,569
1.8	Silicon	3,325	0	3,325
	Contingency	29,025	- 601	28,424
	U.S. CMS Total Project Cost Baseline	167,250	0	167,250

U.S. LHC Accelerator Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Interaction Region Components	50,328	4,779	55,107
1.2	Radio Frequency Straight Section	15,714	1,434	17,148
1.3	Superconducting Wire and Cable	11,868	1,458	13,326
1.4	Accelerator Physics	5,133	- 1,056	4,077
1.5	Project Management	13,612	- 74	13,538
	Contingency	13,345	- 6,541	6,804
	U.S. LHC Accelerator Total Project Cost Baseline	110,000	0	110,000

8. SCHEDULE STATUS AND PLANS

8.1 U.S. ATLAS Construction Project Milestones The milestones have been updated with the new ETC baseline dates.

U.S. ATLAS Major Project Milestones (Level 1)

Description	Baseline Schedule	Forecast (F) Date	Actual (A) Date
Project Start	01-Oct-95	01-Oct-95 (F)	01-Oct-95 (A)
Project Completion	30-Sep-05	30-Sep-05 (F)	

U.S. ATLAS Major Project Milestones (Level 2)

Subsystem	Schedule Designator	Description	Baseline Schedule	Forecast (F) / Actual (A) Date
Silicon (1.1)	SIL L2/1	Start Full Silicon Strip Electronics Production	06-Jul-01	15-Jul-01 (F)
Smeon (1.1)	SIL L2/2	Start Full Strip Module Production	07-Jan-02	07-Jan-02 (F)
	SIL L2/3	ROD Design Complete	01-Oct-01	01-Oct-01 (F)
	SIL L2/4	Complete Shipment of Silicon Strip Module Production		13-Oct-03 (F)
	SIL L2/5	ROD Production/Testing Complete	24-Jun-03	24-Jun-03 (F)
	SIL L2/6	Pixels 1 st IBM Prototype Submitted	26-Jul-01	17-Sep-01 (F)
	SIL L2/7	Pixels Start IBM Production	13-Mar-03	13-Mar-03 (F)
	SIL L2/8	Pixels Start IBM Outer Bare Module Prod	22-Oct-03	22-Oct-03 (F)
	SIL L2/9	Pixels Disk System at CERN	13-Oct-04	13-Oct-04 (F)
TRT (1.2)				
Mechanical	TRT L2/1	Final Design Complete	31-Dec-98	07-Dec-98 (A)
	TRT L2/2	Module Production Complete (CUM 102)	31-Mar-03	31-Mar-03 (F)
	TRT L2/3	Barrel Construction Complete	16-Sep-03	16-Sep-03 (F)
Electrical	TRT L2/4	Select Final Elec Design	15-Jun-01	30-Aug-00 (A)
	TRT L2/5	Start Production of ASICS	18-Jan-02	18-Jan-02 (F)
	TRT L2/6	Installation Complete	04-Jan-05	04-Jan-05 (F)
LAr Cal	LAr L2/1	Cryostat Contract Award	24-Jul-98	05-Aug-98 (A)
(1.3)	LAr L2/2	Barrel Feedthroughs Final Design Review	30-Sep-98	02-Oct-98 (A)
	LAr L2/3	Start Electronics Production (Preamps)	30-Jun-00	30-Jun-00 (A)
	LAr L2/4	FCAL Mechanical Design Complete	14-Dec-98	15-Dec-99 (A)
	LAr L2/5	FEB SCA Prod. Chip Submission/Contract Award	19-Jul-01	01-Oct-01 (F)
	LAr L2/6	Level 1 Trigger Final Design Complete	04-Oct-01	04-Oct-01 (F)
	LAr L2/7	ROD Final Design Complete	12-Dec-02	12-Dec-02 (F)
	LAr L2/8	Motherboard System Production Complete	30-Jun-02	30-Jun-02 (F)
	LAr L2/9	Cryostat Arrives at CERN	15-May-01	02-Jul-01 (F)
	LAr L2/10	Barrel Feedthroughs Production Complete	15-Feb-02	15-Feb-02 (F)
	LAr L2/11	FCAL-C Delivered to EC	17-Oct-02	17-Oct-02 (F)
	LAr L2/12	FCAL-A Delivered to EC	08-Dec-03	08-Dec-03 (F)

U.S. ATLAS Major Project Milestones (Level 2) (cont'd)

Designator	1	Schedule	Forecast (F) / Actual (A)
		Schedule	Date
Tile L2/1	Start Submodule Procurement	01-Sep-97	01-Sep-97 (A)
Tile L2/2	Technology Choice for F/E Electronics	15-Nov-97	15-Nov-97 (A)
Tile L2/3	Start Module Construction	01-May-99	20-Sep-99 (A)
Tile L2/4	Start Production of Motherboards	01-Apr-01	30-Mar-01 (A)
Tile L2/5	All Electronic Components Delivered to CERN	01-Oct-02	01-Oct-02 (F)
Tile L2/6	Module Construction Complete	30-Sept-02	30-Sep-02 (F)
Tile L2/7	All Modules Delivered to CERN	02-Dec-02	02-Dec-02 (F)
Muon L2/1	Start MDT Chambers Lines 1 and 3	17-Jul-00	15-Sep-00 (A)
			01-Sep-01 (F)
			01-Oct-01 (F)
Muon L2/4	Final Design of Global Alignment Devices Complete	01-Apr-02	01-Apr-02 (F)
Muon L2/5	CSC IC Production Complete	15-May-02	15-May-02 (F)
Muon L2/6	Kinematic Mount Design Complete	30-Jan-01	30-Jan-01 (A)
Muon L2/7	MDT Chambers (U.S.) Production Complete	27-Aug-04	14-Sep-04 (F)
Muon L2/8	Kinematic Mount Production Complete	24-May-04	24-May-04 (F)
Muon L2/9	CSC ROD Production Complete	05-Nov-03	05-Nov-03 (F)
Muon L2/10	MDT Elec.'s Mezzanine Production Complete	06-Mar-03	06-Mar-03 (F)
Muon L2/11	CSC Assembly/Testing at CERN Complete	17-Dec-04	17-Dec-04 (F)
Muon L2/12	Global Alignment System Final Delivery	30-Sep-04	30-Sep-04 (F)
TDAQ L2/1	Select Final LVL2 Architecture	31-Dec-99	31-Mar-00 (A)
TDAQ L2/2	LVL2 Trigger Design Complete	31-Dec-02	31-Dec-02 (F)
TDAQ L2/3	LVL2 Trigger Prototype Complete	30-Sep-02	30-Sep-02 (F)
TDAQ L2/4			08-Jan-03 (F)
~	Start Installation & Commissioning	05-Mar-03	05-Mar-03 (F)
TDAQ L2/6	Production Complete	30-Jul-05	30-Jul-05 (F)
TDAQ L2/7	LVL2 Installation & Commissioning Complete	30-Sep-05	30-Sep-05 (F)
	Tile L2/2 Tile L2/3 Tile L2/4 Tile L2/5 Tile L2/5 Tile L2/6 Tile L2/7 Muon L2/1 Muon L2/2 Muon L2/3 Muon L2/4 Muon L2/4 Muon L2/6 Muon L2/7 Muon L2/8 Muon L2/9 Muon L2/10 Muon L2/11 Muon L2/12 TDAQ L2/1 TDAQ L2/2 TDAQ L2/3 TDAQ L2/4 TDAQ L2/5 TDAQ L2/6	Tile L2/2 Tile L2/3 Tile L2/4 Tile L2/4 Tile L2/5 Tile L2/6 Tile L2/6 Tile L2/7 Tile L2/7 Module Construction Complete All Modules Delivered to CERN Module Construction Complete All Modules Delivered to CERN Muon L2/1 Muon L2/2 Muon L2/2 Muon L2/3 Muon L2/4 Tinal Design of Global Alignment Devices Complete Muon L2/5 Muon L2/6 Muon L2/7 Muon L2/7 Muon L2/8 Muon L2/9 Muon L2/9 Muon L2/10 Muon L2/10 Muon L2/10 Muon L2/11 Muon L2/12 TDAQ L2/1 TDAQ L2/1 TDAQ L2/2 TDAQ L2/4 TDAQ L2/4 TDAQ L2/5 TDAQ L2/5 TDAQ L2/6 TDAQ L2/7 TDAQ L2/7 TDAQ L2/7 TDAQ L2/7 TDAQ L2/6 TDAQ L2/7 TEchnology Chomplete Tomponents Delivered to CERN Telectronic Complete Tomponents Delivered to CERN Telectronic Complete Tomponents Delivered to CERN Tomponents Delivered to CERN Module Construction Complete Tomponents Delivered to CERN Tomp	Tile L2/2 Tile L2/3 Tile L2/4 Tile L2/4 Tile L2/5 Start Module Construction Tile L2/5 Start Module Construction Tile L2/5 All Electronic Components Delivered to O1-Oct-02 CERN Tile L2/6 Tile L2/7 All Module Construction Complete Tile L2/7 All Module Construction Complete Tile L2/7 All Module Construction Complete Tile L2/7 All Modules Delivered to CERN Tile L2/7 All Modules Delivered to CERN Tile L2/6 Tile L2/7 All Modules Delivered to CERN Tile L2/6 Tile L2/7 All Modules Delivered to CERN Tile L2/6 Tile L2/7 All Modules Delivered to CERN Tile L2/6 Tile L2/7 All Modules Delivered to CERN Tile L2/6 Tile L2/7 All Modules Delivered to CERN Tile L2/6 Tile L2/7 All Electronic Complete To1-O2-Dec-02 To2-Dec-02 T

Figure 8.1.1 U.S. ATLAS Milestone Schedule Status Report

ID	Milestone	ETC 01 Baseline	Forecast	Actual	3 4		1998	1999	2000	2001	2002	2003
1	Project Start (10/1/95)	Sun 10/1/95	Sun 10/1/95	Sun 10/1/95	3 4	11	2 3 4	1 2 3	4 1 2 3	4 1 2 3 4	4 1 2 3 4	1 2 3
2	Start Submodule Procurement	Sun 10/1/95 Mon 9/1/97	Mon 9/1/97	Mon 9/1/97	l _	1						
3						1_						
	Technology Choice for F/E Electronics	Sat 11/15/97	Sat 11/15/97	Sat 11/15/97	-			.1				
5	Cryostat Contract Award Barrel FTs Final Design Review	Fri 7/24/98 Wed 9/30/98	Wed 8/5/98 Fri 10/2/98	Wed 8/5/98 Fri 10/2/98	-			<u>'</u>				
6	-	Thu 12/31/98	Mon 12/7/98	Mon 12/7/98	-		,					
7	Final Design Complete	Mon 12/14/98	Wed 12/15/99	Wed 12/15/99	-							
8	FCAL Mech Design Complete Start Module Construction	Sat 5/1/99	Mon 9/20/99	Mon 9/20/99	-				_			
9	Select Final LVL2 Architecture	Fri 12/31/99	Fri 3/31/00	Fri 3/31/00	-				T			
10	Start Elec.'s Production (Preamps)	Fri 6/30/00	Fri 6/30/00	Fri 6/30/00	-					_		
11	, , ,				-							
12	Start MDT Chambers Lines 1 & 3 Kinematic Mount Design Complete	Mon 7/17/00 Tue 1/30/01	Fri 9/15/00 Tue 1/30/01	Fri 9/15/00 Tue 1/30/01					_ E			
	• .				4							
13	Start Production of MBs	Sun 4/1/01	Fri 3/30/01	Fri 3/30/01								
14	Cryostat Arrives at CERN	Tue 5/15/01	Mon 7/2/01	NA NA								
15	Select Final Elec Design	Fri 6/15/01	Wed 8/30/00	Wed 8/30/00							_	
16	Start Full Silicon Strip Elec Production	Fri 7/6/01	Sun 7/15/01	NA							0 0 0 0	
17	FEB SCA Prod Chip Submission/CA	Thu 7/19/01	Mon 10/1/01	NA NA	Į.						KP.	
18	Pixels '1st IBM Prototype Submitted'	Thu 7/26/01	Mon 9/17/01	NA							T.P	
19	Start CSC Chamber Production	Sat 9/1/01	Sat 9/1/01	NA NA	1						9	
20	ROD Design Complete	Mon 10/1/01	Mon 10/1/01	NA							P	
21	Level 1 Trigger Final Design Complete	Thu 10/4/01	Thu 10/4/01	NA							12	
22	MDT Electronics ASD PRR	Fri 10/19/01	Fri 10/19/01	NA NA								
23	Start Full Strip Module Production	Mon 1/7/02	Mon 1/7/02	NA								
24	Start Production of ASICS	Fri 1/18/02	Fri 1/18/02	NA NA								
25	Barrel FTs Production Complete	Fri 2/15/02	Fri 2/15/02	NA NA								
26	Final Design of Global Align Devices	Mon 4/1/02	Mon 4/1/02	NA NA								
27	CSC IC Production Complete	Wed 5/15/02	Wed 5/15/02	NA NA								
28	MB System Production Complete	Sun 6/30/02	Sun 6/30/02	NA								
29	LVL2 Trigger Prototype Complete	Mon 9/30/02	Mon 9/30/02	NA NA								000000
30	Module Construction Complete	Mon 9/30/02	Mon 9/30/02	NA								₽
31	All Elec.'s Components Delivered to ATLAS	Tue 10/1/02	Tue 10/1/02	NA NA								₽
32	FCAL-C Delivered to EC	Thu 10/17/02	Thu 10/17/02	NA NA								
33	All Modules Delivered to CERN	Mon 12/2/02	Mon 12/2/02	NA NA								
34	ROD Final Design Complete	Thu 12/12/02	Thu 12/12/02	NA								
35	LVL2 Trigger Design Complete	Tue 12/31/02	Tue 12/31/02	NA								
36	Start Production	Wed 1/8/03	Wed 1/8/03	NA								
37	Start Installation & Commissioning	Wed 3/5/03	Wed 3/5/03	NA NA								
38	MDT Elec.'s Mezz Production Complete	Thu 3/6/03	Thu 3/6/03	NA NA								
39	Pixels 'Start IBM Production'	Thu 3/13/03	Thu 3/13/03	NA NA				1				
40	Module Production Complete (CUM 102)	Mon 3/31/03	Mon 3/31/03	NA NA								
41	ROD Production/Testing Complete	Tue 6/24/03	Tue 6/24/03	NA NA								
42	Barrel Construction Complete	Tue 9/16/03	Tue 9/16/03	NA NA								
43	Compl Shipment of Silicon Strip Modules Prod	Mon 10/13/03	Mon 10/13/03	NA NA								
44	Pixels 'Start IBM Outer Bare Module Prod'	Wed 10/22/03	Wed 10/22/03	NA NA								
45	CSC ROD Production Complete	Wed 11/5/03	Wed 11/5/03	NA								
46	FCAL-A Delivered to EC	Mon 12/8/03	Mon 12/8/03	NA NA	1							
47	Kinematic Mount Production Complete	Mon 5/24/04	Mon 5/24/04	NA NA	1							
48	MDT Chambers (U.S.) Prod Compl (Qty. 240)	Fri 8/27/04	Tue 9/14/04	NA]			1				
49	Global Align System Final Delivery	Thu 9/30/04	Thu 9/30/04	NA]							
50	Pixels 'Disk System at CERN'	Wed 10/13/04	Wed 10/13/04	NA								
51	CSC Assembly/Test at CERN Complete	Fri 12/17/04	Fri 12/17/04	NA				1				
52	Installation Complete	Tue 1/4/05	Tue 1/4/05	NA								
53	Production Complete	Sat 7/30/05	Sat 7/30/05	NA								
54	Installation & Commissioning Complete	Fri 9/30/05	Fri 9/30/05	NA.	1			1		1	1.1	

8.2 U.S. CMS Construction Project Milestones

System	Level?	CMS ID	History	Dassine Start	Stat	Variance	600 C	1908 (1)0-0-3	2000 ot Apr	Colline	200.	2 2900 # DOLLAR	Ott April	od Am
			# CMS Li Milectores	NA.	Oct 31 '96	0 days		-			1		-	
21421	ML1		Project-Stars (10/31/95)	Ost 31 95	Ort 31 95	0 days								
3481	MLI	D-004	Submit Trigger Technical Design Report (TDR)	Nev 30 10	New 30 90	0 days								
1840	MU	D-014	Submit DAQ Technical Design Report (TDR)	Dec 31 91	Dec 31 91	0 days								
23431	MU	28-017	End Assembly of H5 (Burst) in Surface Hall (SCS)	24631 102	24631 92	O days						•		
31451	MU	HB-012	End Agreembly of HE (Endoug) in SIG	Mw 31 T3	Mw 31 93	O days								
CMSL	MLI	303-010	End Trial Invertion of HB in Verticas Teak	May 81 93	24/31/93	65 days						•	٠ .	
CMSL	MLI	E-015	Trial Mounting of EB Supermodule on HB Complete	Aug 31 %3	Aug 31 93	0 days							•	
CMSt	MLI	3.022	Clase Yoke and Start Magnet Test in SSS	Sep 30 %3	Sep 30 93	0 days							•	
C3421	MLI	HB-023	End Installation and Test of HB in UX5	May 31 94	Mey 31 94	0 days								
C3481	MU	HB-015	End Installation and Test of HE in UICI	34(3) 94	24(3) 94	0 days								
CMSL	MU	3-019	End Inst., Testing, & Debug, of EB (base); in UKS	Ort 31 14	0:63194	0 days								•
CMSL	MU	34-019	End Install, of ME (Endosp) Stations in YE in UKS	Mar 31 10	Mar 31 93	O days								
C1451	MLI	T-014	End Installation and Test of Teacher in UICS	Jun 30 %5	Jun 30 95	0 days								
CMSL	MLI	HF-025	End Installation and Test of HF in UCC	Jun 30 %5	Jun 30 95	0 days								
CMSt	MLI		Project Completion (8/90/85)	Sep 30 %5	Sep 30 9.5	0 days								
			II Muon System (WBS 1.1)	NA.	Dec 02 '98	0 days								
HOUM	ML3	M-009	Mechanical Engineering Design Review	Dec 31 98	Dec 02 98	-14 days	18	•						
NOUM	ML2	34-010	Begin Mass Production of CSC Facts (panels)	Apr 30 99	May 31 99	21 days		6						
MUUN	ML2	34-013	Begin Assembly of Cathode Stap Chambers at FSAL	Ort 31 79	241490	173 days								
MUUN	ML2	M-012	Pre-Production ASIC's Ready	Nov 30 99	Aug 01 90	164 days			• •	1				
MUUN	ML2	M-013	Begin Mass Production of Electronics Boards	Aug 31 '80	Jan.0491	90 days			•					
MUCH	ML2	34.014	Begin Mounting Electronics and Testing at UCLA/UF	Sep 30 90	Oct 31 91	273 days				•	*			
MUON	ML2	M-015	Begin CSC Assentity-PNPLSt. Petersburg & IHEP/Briging	Jan 31 '91	Sep 30 91	173 days				•	*			
MUON	ML2	M-016	50% of the Chambers Installed	34(3) 183	7443193	0 days								
NOUM	ML2	34-017	All Large Chambers Assembled and Tested	Ort 31 T3	0 et 31 f/3	0 days							•	
MUUM	ML2	34-018	All Chambers Installed	Mar 31 14	Mar 31 94	0 days							•	
			☐ BCAL System (WBS 1.2)	NA.	Oct 02 '96	D days		- 1						
HCAL	ML2	383-050	HB: FFF1 Absorber Dekvered to CERM	Oct 31 90	Oct 02 90	-21 days	9							
RICAL.	ML2	389-001	HR: Mechanical Engineering Design Review	Nov 30 98	Nev 03 90	-39 days	9							
RCAL	ML2	HB-052	HB: FFF2 Absorber Dekreered to CERN	Apr 28 99	Apr 15 99	.9 days		•						
HCAL	ML2	HO-001	HO Engineering Design Review	Jun 88 99	Jun 02 99	-4 days		•						
HCAL	ML2	HE-001	HE Mechanical Engineering Design Review	Sep 30 99	Jun 12 99	-38 days		*						
HCAL	ML2	HF-006	HF Engineering Dunign Review Complete	Ort 31 90	Aug 31 91	208 days				•	*			
System	Leveth	GED	Miestone	Baseine Start	Start	Variance	200	1989	2906		1 200			2800
HCAL	ML2	HB-010	total and the second				(PORTO	орчоги	201 P-02	рупин	STORTER	BLD:S21646	Oct Por	OCT PA
			HB-1 Absorber Delivered to CSBM	Nov 30 '00	Nov 30 '00	D depte		_		100				
HCAL			HB-1 Abouther Delivered to CERN HF: Define Fiber Diameter	Nov 30 '00 Jan 31 '00	Nov 30 '08 Jap 31 '01	D days D days								
HCAL HCAL	M1.2	HF-028	HF: Define Piber Dismeter	Jun 31 '01	Jan 31 '01	D days				٠.				
HCAL HCAL HCAL			MF: Define Pitter Dismeter Complete Foont-and Electronics Freduction			D days 337 days				٠.		•		
HCWL	ML2 ML2	HF-038 HB-039	MF: Define Piber Dismeter Complete Poord-and Electronics Production. HBH: Absorber Delivered to CESM	Jun 31 '01 Jun 30 '01 Dec 31 '01	Jan 31 '01 Oct 31 '02 Dec 31 '01	D days 337 days D days				٠.		٠.		
HCAL HCAL	ML2 ML2 ML2	HF-038 HB-039 HB-014 HB-014	NF: Define Piter Dismeter Complete Food-and Electronics Production IEE+1 Absorber Delivered to CESH RO Optics Installation on VE Completed	Jun 30 '00 Jun 30 '00 Dec 30 '00 Jun 30 '00	Jan 31 '01 Oct 31 '02 Dec 31 '01 Jun 30 '03	D days 337 days D days D days				٠.		٠.	••	
HCAL HCAL HCAL	ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-034 S80-083 HB-031	NF: Define Piter Dismeter Complete Food-end Electronics Production IEE+1 Absorber Delivered to CESH IEO Optics Installation on YE Completed IEE End Installation in Submoid in USS	Jan 38 '00 Jan 38 '00 Dec 38 '00 Jan 38 '03 Dec 08 '03	Jan 31 '01 Oct 31 '02 Dec 31 '01 Jun 30 '03 Mer 31 '04	B dieyo 337 dieyo B dieyo B dieyo 75 dieyo				٠.		٠.	••	
HCAL HCAL HCAL	ML2 ML2 ML2 ML2	HF-038 HB-039 HB-014 HB-014	MF: Define Fiber Dismeter Complete Food-end Electronice Freduction HBH I Absorber Deforeed to CERN HD Option Installation on YB Completed HB End Installation in Telepoid in USS HD End Installation and Tests in USS	Jan 31 '01 Jun 38 '01 Dec 31 '01 Jun 38 '03 Dec 01 '03 Age 38 '03	Jan 31 '01 Oct 31 '02 Dec 31 '01 Jun 30 '03 Mer 31 '04 Age 30 '05	D depo 337 depo D depo D depo 75 depo D depo				٠.		٠.	••	
HOAL HOAL HOAL HOAL	ML2 ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-034 HB-031 HB-037	HF: Define Piter Dismeter Complete Poord-end Electronice Production HBH Absorber Deformed to CESH HB O Optice Installation on TB Completed HB End Installation in Stelemant in USS HD End Installation and Twee in USS Tribles System (WBS 1.3)	Jan 31 '01 Jun 30 '01 Dec 31 '01 Jun 30 '03 Dec 01 '03 Age 30 '03 NA	Jan 31 '01 Oct 31 '02 Dec 31 '01 Jun 30 '03 Mar 31 '04 Age 30 '05 Nec 63 '98	D degre 237 degre D degre D degre 75 degre D degre O degre				٠.		٠.	••	•
HOAL HOAL HOAL	ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-034 S80-083 HB-031	HF: Define Fiber Dismeter Complete Food-end Bestronian Freduction HBH Absorber Deformed to CESH HD Optics Installation on TB Completed HB: End Installation in Submoid in UKS HD find Installation and Teste in UKS H Trides System (WBS 1.3) Complete Initial Muon, Culotimeter, & Global Tagger Deni	Jan 31 '00 Jun 30 '00 Dec 31 '00 Jun 30 '00 Dec 01 '00 Age 30 '00 NA 35 ov 30 '90	Jan 31 '01 Oct 31 '02 Dec 31 '03 Jun 30 '03 Mer 31 '04 Age 30 '05 Ner 03 '98 Nov 03 '98	D depo 337 depo D depo D depo 75 depo D depo				٠.	•	٠.	••	•
HOAL HOAL HOAL HOAL HOAL	ML2 ML2 ML2 ML2 ML2 ML2 ML2	HF-038 HB-034 HB-034 HB-031 HC-087	HF: Define Piter Dismeter Complete Poord-end Electronice Production HBH Absorber Deformed to CESH HB O Optice Installation on TB Completed HB End Installation in Stelemant in USS HD End Installation and Twee in USS Tribles System (WBS 1.3)	Jan 31 '01 Jun 30 '01 Dec 31 '01 Jun 30 '03 Dec 01 '03 Age 30 '03 NA	Jun 31 VI Out 31 VI Duc 31 VI Jun 30 VI May 30 VI New 63 VI Blow 60 VI May 10 VI May 10 VI	8 deps 237 deps 8 deps 8 deps 75 deps 8 deps • deps -15 deps				٠.	•	٠.	••	•
HOAL HOAL HOAL HOAL TRIO DAQ	ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-034 HB-031 HC-087 D-081	HF: Define Fiber Dismeter Complete Food-and Bestronian Freduction. HB+1 Absorber Delaward to CESH HO Optics Installation on TP Completed HB: End Installation in Submoid in UKS HO End Installation in Submoid in UKS HO End Installation and Teste in UKS Trides System (WBS 1.3) Complete Initial Moon, Cultetinater, & Clobal Trigger Designations Unit Protetype 2 (Design of)	Jan 31 '00 Jan 30 '00 Dec 31 '00 Jan 30 '00 Dec 01 '00 Age 30 '00 NA Nov 30 '90 May 10 '99	Jun 31 VI Out 31 VI Duc 31 VI Jun 30 VI May 30 VI New 63 VI Blow 60 VI May 10 VI May 10 VI	E dega 237 dega E dega E dega 75 dega E dega -15 dega E dega E dega			9	٠.		•	••	•
HOAL HOAL HOAL HOAL TRIO DAQ DAQ	ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-034 HB-031 HC-087 D-085 D-085	HF: Define Piter Dismeter Complete Poord-end Electronice Production HB+1 Absorber Deformed to CESH HD Option Installation on TB Completed HB End Installation in Eulemaid in UKS HD End Installation and Tests in UKS HD End Installation and Tests in UKS HT Tribles System (WBS 1.3) Complete Initial Macr., Calculates, & Clobal Trigger Design Beaderst Unit Protetype 2 (Design of) Desat Builder Protetype 1 Complete Complete Phase 1 Protetype Design	Jan 3, 70 Jan 30 70 Dec 31 70 Jan 30 70 Dec 01 70 Age 30 70 NA May 10 99 May 3, 79	Jan 31 VI. Oct 31 VI. Dec 31 VI. Fan 30 VI. Mer 31 VI. Age 30 VI. Fan 30 VI. Mer 31 VI. May 10 VI. May 10 VI. May 10 VI. May 10 VI. Slov 00 VI.	E dispe 237 dispe E dispe E dispe 75 dispe E dispe -19 dispe -19 dispe -19 dispe -20 dispe -20 dispe		* 9	9	٠.	•	•	••	•
HOAL HOAL HOAL HOAL TRIO DAQ DAQ TRIO DAQ	ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-034 HB-031 HB-031 HB-007 D-085 D-086 D-082 D-087	HF: Define Fiber Dismeter Complete Foord-end Electronice Freduction HBH I Absorber Deformed to CESH HD Option Installation on TB Completed HB End Installation in Electronic in USS HD End Installation and Twite in USS HD End Installation and Twite in USS HT Tribles System (WBS 1.3) Complete Initial Macr., Calculates, & Clobal Trigger Design Resident Unit Protetype 2 (Design of) Desat Builder Footstype 1 Complete Complete Fibrae 1 Protetype Design Resident Unit Protetype 2 Complete	Jan 31 70 Jan 30 70 Jan 30 70 Jan 30 70 Der 01 70 Age 30 70 NA May 31 79 May 31 79 Sov 30 79 Sov 30 79	Jan 31 VII. Oct 31 VII. Dec 31 VII. Fan 30 VII. Mec 31 VII. Age 30 VII. Nov 03 VII. May 18 VII. May 18 VII. May 18 VII. May 18 VII. Slov 03 VII. Slov 03 VII. Slov 03 VII.	8 days 337 days 8 days 9 days 15 days 8 days -19 days -19 days -19 days -28 days -28 days		* 9	9 9 9	٠.	•	•	••	
HOAL HOAL HOAL HOAL TRIO DAQ DAQ TRIO DAQ DAQ	ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-034 HB-031 HB-037 D-085 D-085 D-082 D-087 D-088	HF: Define Fiber Dismeter Complete Food-end Electronics Freduction HBH Absorber Delivered to CESH HD Optics Installation on TR Completed HB End Installation in Submoid in UKS HD End Installation and Tests in UKS HD End Installation and Tests in UKS H Trides System (WBS 1.3) Complete Initial Muors, Calcutmeter, & Global Trigger Design Headers Unit Prototype 2 (Design of) Event Endler Prototype 1 Complete Complete These 1 Prototype 2 Complete Filter Unit Prototype 1 Complete Filter Unit Prototype 2 Complete	Jan 31 70 Jan 30 70 Dec 31 70 Jan 30 70 Dec 01 70 Age 30 70 NA Nov 30 90 May 31 99 Sov 30 99 Sov 30 99	Jan 31 '01 Det 31 '02 Det 31 '02 Jan 30 '03 Mer 31 '04 Age 30 '05 Nov 03 '98 Nov 03 '98 May 18 '99 May 18 '99 Nov 02 '99 Nov 02 '99 Nov 02 '99	8 days 10 days 1 days 10 da		* 9	9 9 9 9	٠.	•	•	••	
HOAL HOAL HOAL HOAL HOAL TRIO DAQ DAQ DAQ DAQ DAQ	ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2	HF-038 HB-039 HB-044 HB-040 HB-007 D-085 D-086 D-082 D-088 D-088 D-088 D-088	HF: Define Piter Dismeter Complete Piter Dismeter Complete Piter Defined Defined to CESS HO Optice Installation on TB Completed HB: End Installation in Submoid in UKS HO End Installation and Tests in UKS HO End Installation and Tests in UKS Trides System (WBS 1.3) Complete Initial Muon, Calotimeter, & Global Trigger Designation Ukst Prototype 2 (Design of) Desat Builder Pistotype 2 (Design of) Resident Unit Prototype 1 Complete Complete Pists 1 Prototype 1 Complete Fifter Unit Prototype 1 Complete Fifter Unit Prototype 1 Complete Fifter Unit Prototype 1 Complete Vertical DAQ Chain Prototype Complete	Jan 31 701 Jan 30 701 Jan 30 701 Dec 31 701 Jan 30 701 Jan 30 701 Dec 01 701 Agr 30 707 NA May 31 799 May 31 799 Slov 30 799	Jun 31 '01 Oct 31 '02 Dec 31 '02 Jun 30 '03 Mer 31 '04 Age 30 '05 Per 63 '98 May 18 '99 May 04 '99 May 04 '99 Slov 02 '99 Slov 02 '99 Slov 02 '99 Slov 02 '99	8 days 237 days 8 days 8 days 10 days 10 days 10 days 13 days 14 days 15 days 16 days 17 days 18 days		* 9	0	٠.	•	•	••	•
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HOAL HOAL HOAL HOAL TRIO DAQ DAQ DAQ DAQ DAQ DAQ DAQ BOAL BOAL BOAL BOAL BOAL BOAL BOAL BOAL	ML2	HF-028 HB-029 HB-024 HB-024 HB-024 HB-024 HB-024 D-085	HF: Define Piber Dismeter Complete Roord-end Electronics Production HBH Absorber Deformed to CERN HD Optics Installation on TR Completed HB End Installation on TR Completed HB End Installation on TR Completed HB End Installation and Teste in UKS HO End Installation and Teste in UKS HO End Installation and Teste in UKS HD End Installation and Teste in UKS HD End Installation and Teste in UKS HD End Installation (WBS 1.3) Complete Installation (WBS 1.3) Description of Description Description of D	Jan 31 VII Jan 31 VIII J	Jan 31 701 Oct 31 702 Dec 31 702 Dec 31 702 Mec 31 704 Age 30 705 Nec 43 798 Mec 91 709 Mec 91 709 Mec 91 709 Nec 90 709 Nec 91 709	1 days 137 days 1 days 2 days 23 days 23 days 23 days 23 days 24 days 24 days 25 days 26 days 27 days 28 days 28 days 28 days 28 days 28 days 29 days 29 days 20 days 20 days 20 days 20 days 21 days 21 days 20 days 21 days	9	* 9	0		•	••	••	
HOAL HOAL HOAL HOAL TRIO DAQ DAQ DAQ DAQ DAQ DAQ DAQ BOAL BOAL BOAL BOAL BOAL BOAL BOAL BOAL	ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2 ML2	HF-028 HB-029 HB-024 HB-024 HB-024 HB-024 HB-024 D-085	HF. Define Piber Dismeter Complete Roord-end Electronice Production HBH I Absorber Deformed to CESH HD Option Installation on TB Completed HB End Installation on TB Completed HB End Installation and Teste in UCS HD End Installation Proteining a Complete Design Headout Unit Proteinings 2 (Design of) Head Dalder Proteinings 2 Complete Complete Phase 1 Proteinings Design Headout Unit Proteinings 2 Complete High Level Proteinings 1 Complete High Level Trapper Potentype 1 Complete High Level Trapper Potentype Complete High Level Trapper Potentype 1 Complete Pot DAQ Chain Proteinings 1 Complete High Level Trapper Potentype 1 Complete High Level Trapper Potentype 1 Complete High Level Trapper Potentype 1 Complete Date of Avalenche Photodiodes SIO Bertemains Chainer Protections House 6 (400 observed) Proteining Complete Replaced (10 observed) Calibrated Pub Bernd (10 Departmedules) Calibrated Pub Bernd (10 Departmedules) Calibrated Pub Bernd (10 Supermodules) Completed High Security (2 Supermodules) Completed High Security (2 Supermodules) Completed High Security (2 Supermodules) Calibrated	Jan 31 VII Jan 31 VIII Jan	Jan 31 70. Oct 31 70. Oct 31 70. Dec 31 70. Pan 30 70. Mec 31 70. Age 30 70. Nec 43 70. Mec 31 70. Aug 31 70. Mec 31 70. Aug 31 70.	1 days 137 days 1 days 2 days 23 days 23 days 23 days 23 days 24 days 24 days 25 days 44 days 26 days 46 days 27 days 47 days 48 days 30 days 31 days	Э	* 9	0		•	••	••	
HOAL HOAL HOAL HOAL HOAL HOAL HOAL HOAL	ML2	HF-028 HB-029 HB-024 HB-024 HB-024 HB-024 HB-024 D-085	HF: Define Piber Dismeter Complete Roord-end Electronics Production HBH Absorber Deformed to CERN HD Optics Installation on TR Completed HB End Installation on TR Completed HB End Installation on TR Completed HB End Installation and Teste in UKS HO End Installation and Teste in UKS HO End Installation and Teste in UKS HD End Installation and Teste in UKS HD End Installation and Teste in UKS HD End Installation (WBS 1.3) Complete Installation (WBS 1.3) Description of Description Description of D	Jan 31 VII Jan 31 VIII Jan	Jan 31 701 Oct 31 702 Dec 31 702 Dec 31 702 Mec 31 704 Age 30 705 Nec 43 798 Mec 91 709 Mec 91 709 Mec 91 709 Nec 90 709 Nec 91 709	1 days 137 days 1 days 2 days 23 days 23 days 23 days 23 days 24 days 24 days 25 days 44 days 26 days 46 days 27 days 47 days 48 days 30 days 31 days	Э	* 9	0		•	•	••	

8.3 U.S. LHC Accelerator Construction Project Milestones

Table 8.3 Level 2 U.S. LHC Accelerator Baseline Milestones through FY2001

	evel 2 U.S. Life Accelerator Dasenne Willestones unfough 1 1 2001		
WBS		Baseline <u>Date</u>	Forecast(F)
<u>Identifiers</u>	Milestone Description		or Actual(A)
Project	Decision as to whether or not the US Project includes RF region	1 Jul 01	20 Jun 01 (A)
	quadrupoles		
Int Region	Begin 1st inner triplet quadrupole model magnet	1 Jul 97	, ,
Int Region	Complete inner triplet quadrupole model magnet program phase 1	1 Dec 99	28 Sep 99 (A)
Int Region	Complete inner triplet quadrupole model magnet program phase 2	1 Mar 00	17 Mar 00 (A)
Int Region	Place purchase order for HTS power leads	1 Feb 00	30 Aug 00 (A)
Int Region	Begin absorber fabrication	1 Nov 00	30 Oct 00 (A)
Int Region	Complete inner triplet quadrupole prototype program	1 Oct 01	1 Sep 01 (F)
Int Region	Begin IR beam separation dipole production assembly	1 Oct 00	25 Jul 00 (A)
Int Region	Begin inner triplet feedbox fabrication	1 Mar 01	15 Nov 01 (F)
Int Region	Begin inner triplet quadrupole production assembly	1 Nov 01	1 May 01 (A)
Int Region	Complete 1 st inner triplet quadrupole magnet	1 Sep 02	1 Sep 02 (F)
Int Region	Delivery of D2 for IR8 left	1 Apr 02	1 Apr 02 (F)
Int Region	Complete inner triplet feedbox fabrication	1 May 02	_
RF Region	Begin assembly of 1st dipole model magnet	1 Sep 99	10 Jun 99 (A)
RF Region	Complete dipole model magnet program	1 Aug 00	
RF Region	Begin RF region dipole production assembly	1 Jan 02	` ′
RF Region	Delivery of D3, D4 for IR4 right	1 Jan 02	` ′
SC Cable	All cable prod. support equipment delivered to CERN	1 Sep 99	28 May 99 (A)
SC Cable	Complete SC testing facility upgrades	1 Jun 99	30 Sep 99 (A)

Meaure	Original	Revised	Funecast.	Actual	1234	1 2 3 4	11 2 3	4 1 2 3	2001 	4 1 2 3	4 1 2 3 4	1 2 3 4	1 2 3
Project Start (10INSC)	Sun 10/1/95		Sun 10/1/85	Sun 101 (95	1=1-1	- 1- 1- 1	1-1-1-				1. 1-1-1-1		11111
Begin 1st Inner Triplet Quadrupale Model Magnet	Tue 231/97	Tue 7/1.67	Tue 7.1 (ST	Tue 7.1 (ST		74							
Complete Superconductor Test Facility Upgrades	Tue 6/1/99	Tue 9/1/99	Thu 9/30/59	Thu 9/30/99				. · • • • • • • • • • • • • • • • • • •					
All Cable Production Support Equipment Delivered to CERN	Wed 9/1/99	Wed 9/1/99	Fri 5/28/99	Fri 5/28/99			525 4	d					
Regin Acceptory of list Dipole Model Magnet	Wed 98199	Med 9/1/99	Thu S/10/99	Thu SAINES			640 4	кĠ					
Complete it mer Triglet Guadrupule Model Magnet Program Phase 1	Wed 12/1/99	Wed12/199	Tue: 5(25)59	Tue 5.05(59			9.36	•					
Place Purchase Order for HTS Power Leads	Tue 2/1/00	Tue 2/1.00	Med 8/30(00)	Wed 8/30/00				Ω	4 838				ĺ
Complete Inner Triplet Quadrupole Model Magnet Program Phase 2	Wed 3/h00	Wed 3/1.00	Fri 3/17/00	FH 9/17/00				347 🚓					
Complete Dipole Model Magnet Program	Tue 8/1/00	Tue 8/1/00	Med 11.8800	Wed 11/8/00					cie m				
Begin RF Region Digitale Production Assembly	Fri 9/1/00	Tue 1/1.02	Tue 1/1 (02)	NA.					4	0.14			
Degin Absorter Febrication	Wed 11.8100	WES11/4.00	Mon 19/30800	Man 19/00/00					20 100				
Complete Inner Triplet Quadrupole Prototype Magnet Program	Fin 12/1/00	Mon 10/1/01	Fri 8/31 (81	NA.				İ	Δ	्रेस्ट्रम			
Begin Interaction Region Beam Separation Dipole Phod. Assembly	The 38101	San 10/1/00	Tue 7(25(00)	Tue 7/25/00				7725	🔸 വ				
Begin Inner Triplet Feestbox Fathrication	The 38101	Thu 3/1/01	Thu:11/15/01	NA.					۵	O Mile	F		
Begin Inner Triplet Quadrupole Production Assembly	Sun 4/15/01	Thu11/1/01	Tue 5/1 (01	Tue 51 (01					51 @	5/1)			
Decision on PT Region Qualitypoles	Sun ZHi01	Sun 7/1.01	Wed 9/30/81	Wed 8/20101					6.21	620			
Complete 1ist ihner Triplet Quartrupole Magnet:	Thu 11.8101	Sun 94.02	Sun 94 ff2	NA.				İ			Ç sa		
Delivery of DS, D4 for R4-right	Tue 1.0102	Tue 1/1.02	Thu 5/1 (03	NA.						۵	0.5	đ	
Delivery of D2 for IRB Left	Mon 4.6102	Mon 4/1.02	Mon 4/1 (E2)	NA.						ω.	ai.		
Complete Inner Triglet Feedbox Fabrication	Wed 58102	Wed 5/1/02	Set 11/1 (63	NA.						C		O MAR	
Delivery of Allinner Triplet System Components for IRO Lett (MSK, DTDH, IRI)	Tue: 10/1/02	Tue-18/18/2	Tue 10/1/02	NA.							Q 1984		
Complete RF Region Dipole Production Assembly	Tue 10/1/02	Tue 10/1/02	Tue 10/1/02	NA.							å ma		
Delivery of D2 for IPS Left	Fit 11.8102	Fri11/1/02	Fri11/1/02	NA.							O 1841		
Delivery of D8, D4 for R4-left	Fit 11.8102	Fri11/1/02	Fri11/1/02	NA.							O 1M4		
Complete Absorber Fabrication	Sun 12/1/02	Sen134.62	Sun 12/1/02	NA.							<u>⊜</u> 128		
Delivery of Allitimer Triplet System Components for IRO Right (MSK, DTDK,DH)	View 1.81(0)	Wed 1/1/03	Wed 1/1 (0)	164							Q 141		
Delivery of D2 for IRB Right	Sat 2/1/08	Set 3/1/03	Sat 2/1 (03	NA.							©28		
Complete Interaction Region Dipole Production Assembly	Set 3/1/08	Sat 3/1.03	Sat 3/1 (E3	NA.							0.34		
Project: Congletion (900005)	Fin 9/80/05	Fri 9/30/05	Fri 9/30/05	NA.									9.3

9. TECHNICAL BASELINE STATUS

<u>U.S. ATLAS Construction Project</u> - No change. The U.S. ATLAS collaboration defined a list of initial deliverables representing the U.S. contribution to ATLAS. This list was approved by the JOG in March 1998. Deliverables are listed in the U.S. ATLAS Construction Project Management Plan, Appendix 3.

<u>U.S. CMS Construction Project</u> - Change to incorporate expanded U.S. CMS participation in the CMS Silicon Tracker Outer Barrel, per approved Level 2 Change Request defining additional associated deliverables, milestones, cost and schedule. The U.S. CMS collaboration defined a list of deliverables representing the U.S. contribution to CMS. This list was approved by the JOG in October 1998. The scope of U.S. CMS contribution is described in the U.S. CMS Management Plan, Appendix 2.

<u>U.S. LHC Accelerator Construction Project</u> - No change. U.S. LHC Accelerator Project - The U.S. deliverables to CERN are defined in the Implementing Arrangement to the Accelerator Protocol. The Implementing Arrangement was signed by the CERN and U.S. signatories in July 1998. Reference the U.S. LHC Accelerator Project Management Plan, Annex II, (Approved 6/15/98).

<u>CERN Direct Purchases</u> - No change. CERN will procure from U.S. industrial firms supplies required to construct the LHC accelerator. These supplies will include superconducting alloy, cable, insulation, and other materials.

10. BASELINE CHANGE ACTIVITY

Baseline Control Level

Level 1, DOE/NSF Joint Oversight Group

Level 2, DOE/NSF Project Office

U.S. ATLAS U.S. CMS

U.S. LHC Accelerator

Baseline Changes

No changes this quarter

No changes this quarter.

Changes to the Level 2 cost, scope and

schedule baseline.

Changes to the Level 2 cost, scope and

schedule baseline.

APPENDIX A - FUNDING BY INSTITUTION (in thousands of dollars)

		31(21(3)				\			on Proje	ect							
	FY 1998				FY 1999				FY 2000				FY 200	1			
	DOE				DOE				DOE				DOE	-			Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
FNAL	0		0	5,517	0		40	10.857	0	5,981	0		0		0		28,388
Fairfield	0		0	29	0	0	0	0	0	10	0		0	13	0		52
Maryland	90	65	0	155	0	132	131	263	0	250	0	250	0	189	0	189	857
Boston U.	0	32	0	32	31	111	0	142	0	132	0	132	0	88	0	88	394
Florida State	60	54	0	114	71	118	0	189	80	54	0	134	68	43	0	111	548
U. of	60	95	0	155	161	452	0	613	141	202	0	343	153	401	0	554	1,665
Minnesota																	
U. of Iowa	77	62	0	139	20	5	0	25	0	453	0	453	0	843	0	843	1,460
U. of Rochester	127	1,159	0	1,286	262	485	0	747	441	253	0		464	143	0	607	3,334
Notre Dame	0		0	52	0	44	184	228	0	14	193	207	0	14	112	126	613
Purdue	38	135	0	173	49	166	0	215	0	175	0	175	0	89	0	89	652
U. of Miss.	46	100	0	146	68	91	0	159	69	108	0	236	0	235	0	235	776
U. of Florida	44	95	0		184	412	0	596	332	853	0				0		2,645
Ohio State U.	140	64	0	204	275	212	0	487	196	732	0		151	700	0	851	2,470
Carnegie	0	113	0	113	0	291	0	291	0	312	0	312	0	258	0	258	974
Mellon																	
Rice	138	19	0		102	56	0	158	132	16	0		196		0		695
U. of	533	1,052	0	1,585	471	3,598	0	4,069	722	2,995	0	3,717	504	4,489	0	4,993	14,364
Wisconsin																	
U.C. Davis	34	100	0		0		0	78	0	502	0		0		0		777
UCLA	150	87	0	237	249	173	0	422	244	391	0			546	42		2,229
U.C. Riverside	20		0		0	164	0	164	0	70	0				0		336
John Hopkins	0		0			0	70	70	0	0	40				5		144
Northwestern	0		0	59	5		0	31	0	114	0		0		0		243
Rutgers	0		0	13	0	0	34	34	0	2	140		0	Ü	101	101	290
Princeton	0		0	256	0	626	0	626	0	667	0		0		0		1,682
Caltech	0		0	148	0	458	0	458	0	367	0		0	.02	0	_	1,425
U.C. San Diego	11	0	0	11	11	90	24	125	36	0	0	- 00			0	43	215
Northeastern	0			0				3,370	0	0	1,741	1,741	0	ŭ	1,482	1,482	6,593
U. IIIChicago	0		0	0	0	0	124	124	0	0	309	309		Ŭ	262	262	695
U. of Nebraska	0		0	0	,			24	0	-	2	2	0		100		126
MIT	0	Ű.	0	37	15	67	0	82	0	78	0			O.	0		284
Iowa State	0	0	0	0	0	0	19	19	0	356	0	356			0		404
Kansas State													0	• •	0		66
LBL													0		0		554
Texas Tech													0	0.0	0		876
UC Santa													0	13	0	13	13
Barbara												I					

U. of Kansas													0	0	6	6	6
Subtotal	1,568	9,382	0	10,950	1,974	18,672	4,020	24,666	2,393	15,087	2,425	19,964	2,315	16,840	2,110	21,265	75,330

APPENDIX B - FUNDING BY INSTITUTION (in thousands of dollars)

								Construct		ct								
	FY	1998			FY [·]	1999			FY	7 2000			FY 2001					
	DOE				DOE				DOE				DOE				Grand	
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contra	NSF	Total	Total	
ANL	0	1,098	0	1,098	0	967	0	967	0	922	0	922	0	172	0	172	3,159	
BNL	0	3,903	0	3,903	0	2,581	0	2,581	0	6,429	0	6,429	0	6,630	0	6,630	19,543	
LBNL	0		0	633	0		0	715	0	420	0	420	0	1,575	0	1,575	3,343	
SUNY/Albany	20	0	0	20	48	0	0	48	50	0	0	50	0	0	0	0	118	
U. of Arizona	320	100	0	420	634	_	0	634	557	0	0	557	298	0	0	_00	1,909	
Boston U.	224	0	0	224	298	0	0	298	287	0	0	287	155	0		.00	964	
Brandeis U.	265	45	0	310	0	0	593	593	0	0	478	478	0	0		731	2,112	
U.C.Irvine	193	0	0	193	0	•	93	93	0	0	0	0	0	0		266	552	
U.C. Santa Cruz	404	0	0	404	63	0	0	63	0	0	568	568	0	0	-,	2,702	3,107	
U. of Chicago	0	54	0	54	0	0	1,069	1,069	0	0	264	264	0	0		723	2,110	
Duke U.	190	0	0	190	601	0	0	601	417	0	0	417	501	0		501	1,709	
Hampton U.	0	0	0	0	0	0	538	538	0	0	293	293	0	0	331	331	1,162	
Harvard	234	0	0	234	0	0	654	654	0	0	390	390	0	0	-,	3,882	5,070	
U. of Illinois	50		0	209	347	0	0	347	294	0	0	294	76	0		76	926	
Indiana U.	190	0	0	190	765		0	765	460	0	0		0	616	0		2,031	
MIT	50		0	50	105	0	0	105	177	0	0	177	190	0		190	522	
Michigan State	0		0	35	0	0	178	178	0	0	293	293	0	0		0	506	
Nevis/Columbia	0		0	675	0		2,680	2,680	0	0	1,422	1,422	0	0		103	4,880	
U. of New Mex.	20		0	20	30		0	30	24	0	0	24	0	80			154	
Northern Illinois	0		0	0	0		0	0	0	0	0	0	0	0			0	
Ohio State U.	0	_	0	0	100		0	100	45	0	0		0	0		_	145	
U. of Michigan	62		0	316	716		0	716	518	0	0	518	681	0	_	681	2,231	
U. of Oklahoma	30	0	0	30	0		41	41	0	0	51	51	0	0		0	171	
U. of Penn.	250	0	0	250	300		0	300	265	0	0	265	679	0		679	1,494	
U. of Pittsburg	110		0	110	0	0	150	150	0	0	210	210	0	50	0	50	520	
U. of Rochester	0	_	0	0	0		3,587	3,587	0	0	1,664	1,664	0	0			5,251	
U.T. Arlington	50		0	132	0		474	474	0	0	230	230	0	0	_	0	836	
S. Methodist	40		0	40	124		0	124	30	0	0	30	87	0	,	87	281	
SUNY/Stony B.	27	0	0	27	0	_	1,045	1,045	0	0	1,037	1,037	0	0	426	426	2,535	
Tufts University	50		0	50	20		0	20	20	0	0	20	0	0	0	0	90	
U. Washington	0		0	0	0		240	240	0	0	318	318	0	0	1,377	1,377	1,935	
U. of Wisconsin	230		0	230	429		0	429	665	0	0	665	1,014	0	0	1,014	2,338	
Subtotal	3,009	7,038	0	10,047	4,580	4,263	11,342	20,185	3,809	7,771	7,218		3,920	9,123	10,590	22,625	71,704	
Reserve	0	3	0	3	157	0	5,289	5,446	327	1,936	1,795	4,058	0	300	0	300	9,807	
									0	2,602	2,928	5,530	0	0	0	0	0	
Total	3,009	7,041	0	10,050	4,737	4,263	16,631	25,631	4,136	12,309	11,941	28,386	3,920	9,423	10,590	22,925	81,511	